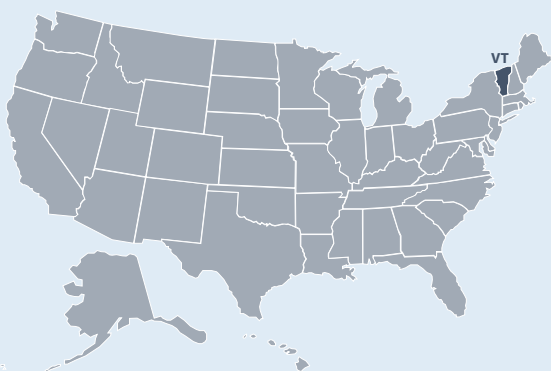




State of Vermont ENERGY SECTOR RISK PROFILE



Vermont State Facts



POPULATION

0.63 M



HOUSING UNITS

0.34 M



BUSINESS ESTABLISHMENTS

0.02 M

ENERGY EMPLOYMENT: 7,950 jobs

PUBLIC UTILITY COMMISSION: Vermont Public Utility Commission
STATE ENERGY OFFICE: Vermont Department of Public Service, Planning and Energy Resources Division

EMERGENCY MANAGEMENT AGENCY: Vermont Emergency Management

AVERAGE ELECTRICITY TARIFF: 15.13 cents/kWh

ENERGY EXPENDITURES: \$4,145/capita

ENERGY CONSUMPTION PER CAPITA: 216 MMBtu
(43rd highest out of 50 states and Washington, D.C.)

GDP: \$33.3 billion

Data from 2020 or most recent year available.

For more information, see the Data Sources document.

ANNUAL ENERGY CONSUMPTION

ELECTRIC POWER: 5,530 GWh

COAL: 0 MSTN

NATURAL GAS: 14 Bcf

MOTOR GASOLINE: 6,200 Mbbl

DISTILLATE FUEL: 4,100 Mbbl

ANNUAL ENERGY PRODUCTION

ELECTRIC POWER GENERATION: 112 plants, 2.3 TWh,
0.9 GW total capacity

Coal: 0 plants

Hydro: 47 plants, 1.3 TWh, 0.3 GW total capacity

Natural Gas: 0 plants

Nuclear: 0 plants

Petroleum: 9 plants, 0.0 TWh, 0.2 GW total capacity

Wind & Solar: 45 plants, 0.5 TWh, 0.3 GW total capacity

Other sources: 11 plants, 0.4 TWh, 0.1 GW total capacity

COAL: 0 MSTN

NATURAL GAS: 0 Bcf

CRUDE OIL: 0 Mbbl

ETHANOL: 0 Mbbl

Data from EIA (2018, 2019).

This State Energy Risk Profile examines the relative magnitude of the risks that the state of Vermont's energy infrastructure routinely encounters in comparison with the probable impacts. Natural and man-made hazards with the potential to cause disruption of the energy infrastructure are identified. Certain natural and adversarial threats, such as cybersecurity, electromagnetic pulse, geomagnetic disturbance, pandemics, or impacts caused by infrastructure interdependencies, are ill-suited to location-based probabilistic risk assessment as they may not adhere to geographic boundaries, have limited occurrence, or have limited historic data. Cybersecurity and other threats not included in these profiles are ever present and should be included in state energy security planning. A complete list of data sources and national level comparisons can be found in the Data Sources document.

Vermont Risks and Hazards Overview

- The natural hazard that caused the greatest overall property loss between 2009 and 2019 was **Flooding** at \$143 million per year (leading cause nationwide at \$12 billion per year).
- Vermont had 64 Major Disaster Declarations, 0 Emergency Declarations, and 0 Fire Management Assistance Declarations for 10 events between 2013 and 2019.
- Vermont registered 6% fewer Heating Degree Days and 46% greater Cooling Degree Days than average in 2019.
- There is 1 Fusion Center located in Williston.

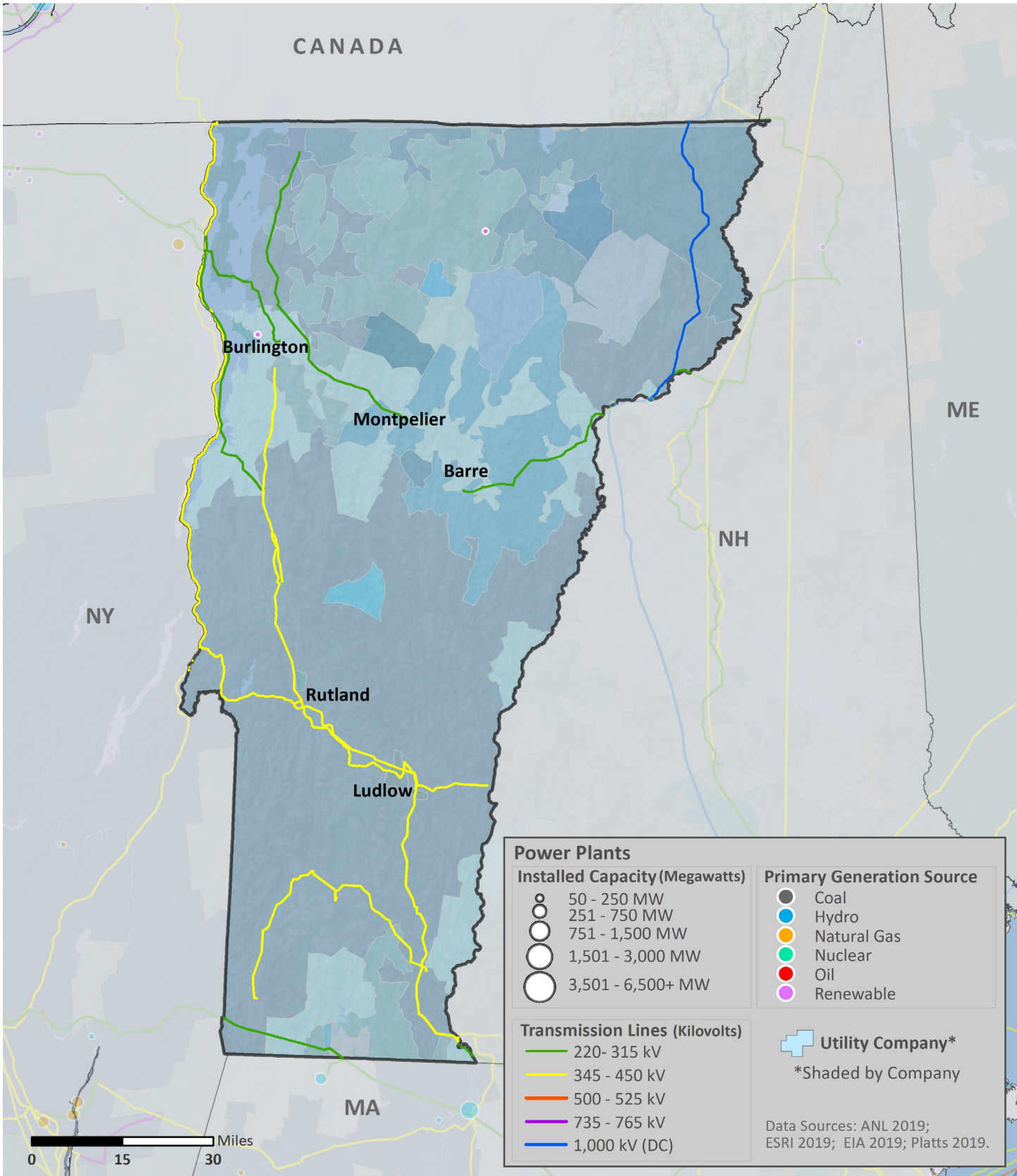
Annualized Frequency of and Property Damage Due to Natural Hazards, 2009 – 2019

	HAZARD FREQUENCY – Annualized	PROPERTY DAMAGE – Annualized (\$Million per year)
Drought	0	\$0
Earthquake (≥ 3.5 M)	0	\$0
Extreme Heat	1	\$0
Flood	8	\$143
Hurricane	<1	\$0
Landslide	<1	\$0
Thunderstorm & Lightning	22	\$3
Tornado	1	\$0
Wildfire	0	\$0
Winter Storm & Extreme Cold	20	\$2

Data Sources: NOAA and USGS



ELECTRIC









Electric Infrastructure

- Vermont has 20 electric utilities:
 - 1 Investor owned
 - 2 Cooperative
 - 14 Municipal
 - 3 Other utilities
- Plant retirements scheduled by 2025: None.

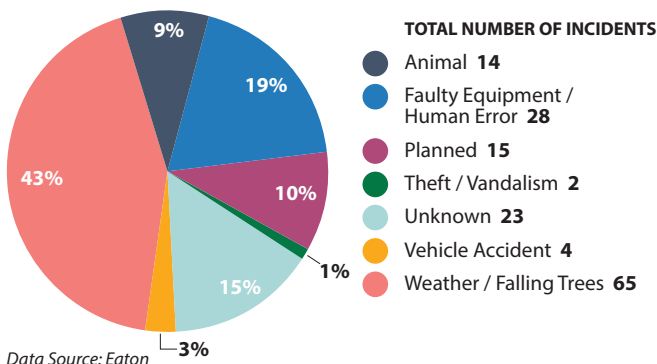
- In 2018, the average Vermont electric customer experienced 2.6 service interruptions that lasted an average of less than 1 hour.
- In Vermont, between 2008 and 2017:
 - The greatest number of electric outages occurred in **December** (4th for outages nationwide)
 - The leading cause of electric outages was **Weather or Falling Trees** (leading cause nationwide)
 - Electric outages affected 60,505 customers on average

Electric Customers and Consumption by Sector, 2018

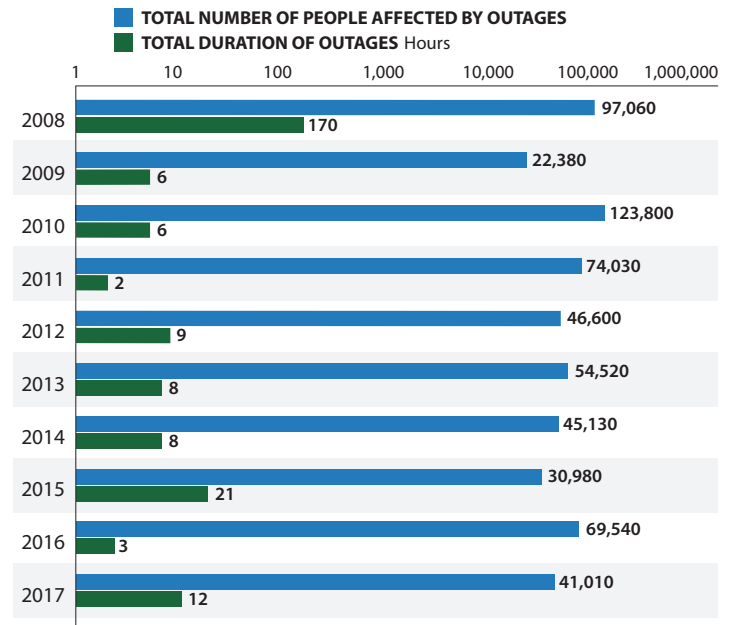
	 CUSTOMERS	 CONSUMPTION
Residential 	85%	38%
Commercial 	15%	36%
Industrial 	<1%	26%
Transportation 	<1%	<1%

Data Source: EIA

Electric Utility-Reported Outages by Cause, 2008 – 2017

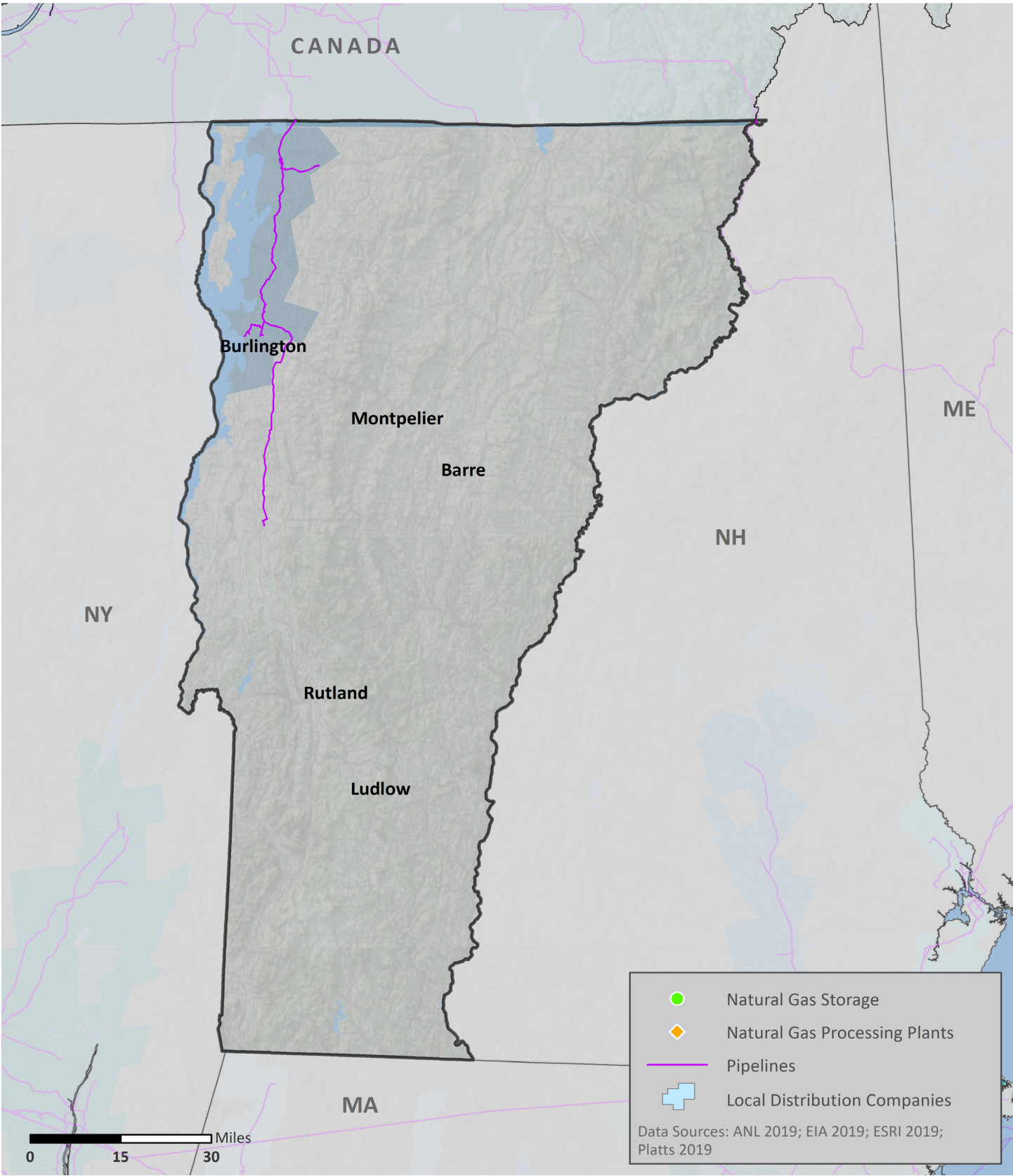


Electric Utility Outage Data, 2008 – 2017





NATURAL GAS



Natural Gas Transport

Top Events Affecting Natural Gas Transmission and Distribution, 1984 – 2019






Transmission Distribution	ECONOMIC LOSS – Annualized Loss \$Thousands per year	FREQUENCY – Annualized Frequency Average incidents per year
Corrosion	\$0	0
Equipment Failure	\$0	0
Excavation Damage	\$0	0
Incorrect Operation	\$0	0
Material / Weld Failure	\$0	0
Miscellaneous / Unknown	\$9	0.03
Natural Force	\$25	0.11
Outside Force	\$558	0.03

Data Source: DOT PHMSA

- As of 2018, Vermont had:
 - 119 miles of natural gas transmission pipelines
 - 862 miles of natural gas distribution pipelines
- 39% of Vermont’s natural gas transmission system and 3% of the distribution system were constructed prior to 1970 or in an unknown year.
- Between 1984 and 2019, Vermont’s natural gas supply was most impacted by:
 - **Outside Forces** when transported by distribution pipelines (leading cause nationwide at \$76.59M per year)

Natural Gas Processing and Liquefied Natural Gas

Natural Gas Customers and Consumption by Sector, 2018

	CUSTOMERS	CONSUMPTION
Residential 	89%	30%
Commercial 	11%	53%
Industrial 	<1%	17%
Transportation 	<1%	<1%
Electric Power 	<1%	<1%
Other	<1%	<1%

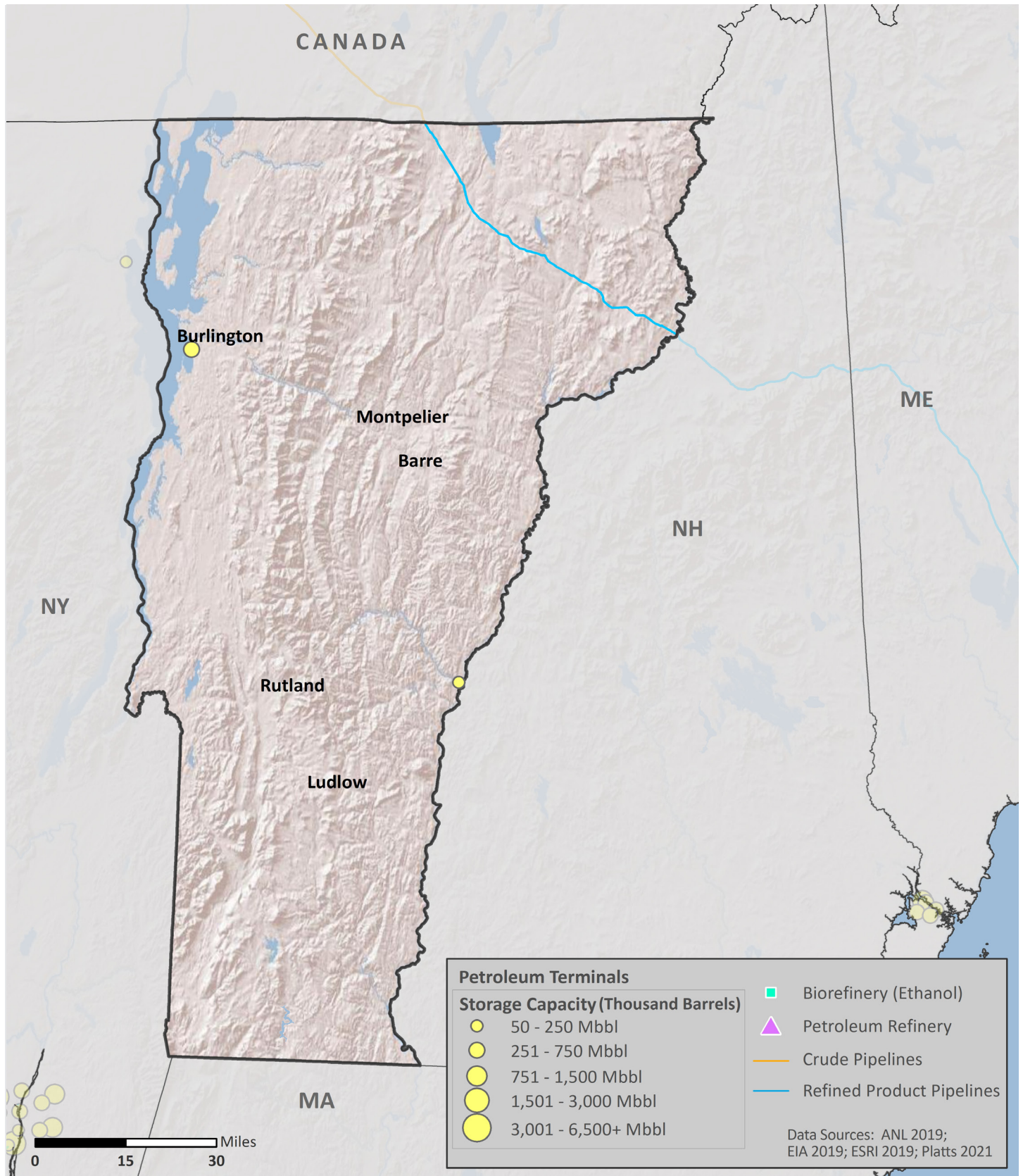
Data Source: EIA

- Vermont has 0 natural gas processing facilities.
- Vermont has 0 liquefied natural gas (LNG) facilities with a total storage capacity of 0 barrels.





PETROLEUM



Petroleum Transport

Top Events Affecting Petroleum Transport by Truck and Rail, 1986 – 2019

	ECONOMIC LOSS – Annualized Loss \$Thousands per year	FREQUENCY – Annualized Frequency Average incidents per year
Corrosion	\$0 \$0	0.03 0
Derailment or Collision / Rollover	\$51 \$35	0.38 0.03
Equipment Failure	\$0 \$3	0 0.03
Incorrect Operation	\$8 \$0	0.62 0
Material / Weld Failure	\$1 \$0	0.21 0
Miscellaneous / Unknown	\$67 \$0	0.53 0
Natural Force	\$19 \$0	0.06 0
Outside Force	\$1,013 \$0	0.12 0

Data Source: DOT PHMSA

Top Events Affecting Crude Oil and Refined Product Pipelines, 1986 – 2019

	ECONOMIC LOSS – Annualized Loss \$Thousands per year	FREQUENCY – Annualized Frequency Average incidents per year
Corrosion	\$0 \$0	0 0
Equipment Failure	\$0 \$0	0 0
Excavation Damage	\$0 \$0	0 0
Incorrect Operation	\$0 \$0	0 0
Material / Weld Failure	\$0 \$0	0 0
Miscellaneous / Unknown	\$2 \$0	0.03 0
Natural Force	\$4 \$0	0.06 0
Outside Force	\$0 \$0	0 0

Data Source: DOT PHMSA

- As of 2018, Vermont had:
 - 117 miles of crude oil pipelines
 - 0 miles of refined product pipelines
 - 0 miles of biofuels pipelines
- 100% of Vermont’s petroleum pipeline systems were constructed prior to 1970 or in an unknown year.
- Between 1986 and 2019, Vermont’s petroleum supply was most impacted by:
 - **Outside Forces** when transported by truck (2nd leading cause nationwide at \$60.45M per year)
 - **Derailments, Collisions, or Rollovers** when transported by rail (leading cause nationwide at \$19.71M per year)
 - **Natural Forces** when transported by crude pipelines (2nd leading cause nationwide at \$15.24M per year)
- Disruptions in other states may impact supply.

Petroleum Refineries

- There are no operating petroleum refineries in Vermont.

